May 2011

WAYPOINTS

This Month's Speakers

On Building - **"Considering Engine Mounts"** - presented by Jack Hardock - will overview considerations in selecting, inspecting and maintaining the often forgotten thing that keeps the rubber band in place.

On Flying - **Alberta Aviation History is Funny... Too"-** presented by Clark Seaborn - will tell stories, about bone headed and funny things done in the realm of Alberta aviation, he promises to not to knowingly tell them about you.

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WAYPOINTS

Newsletter of the EAA Chapter 1410
High River, Alberta, Canada

www.eaahighriver.org

Who We Are

We are an enthusiastic group of like-minded individuals from various backgrounds who share a passion for recreational aviation in Southern Alberta and we offer the chance to meet others who combine fun with learning.

Mountain Waves and Lee Wave Turbulence

Ralph Inkster

Glider pilots love days like this. Played right, the sky promises long flights, strong lifts and potential of long distant glides. Their flight paths are usually on narrow courses following the ridges of terrain that is deflecting the air mass upward. They are 'riding the wave'.

Powered pilots on the other hand should be wary when cloud formations show rows of cumulous and lenticular clouds. These are signs of a rough ride ahead. Powered pilots usually don't 'ride the wave', their plan probably calls for *ploughing through it*, their destination somewhere on the other side of the ridge.

The ***wave*** is the result of a relatively fast moving stable air mass being deflected over an obstacle, like a mountain range, then following downward on the lee side of the range, then oscillating up and down a number of times before eventually stabilizing out somewhere down stream of the obstacle. Under these upward oscillations is a turbulent area where the air is rolling over and causing cumulus clouds called Rotors. At the upper areas of the oscillations are clouds called *lenticulars*.

Wave conditions are usually produced if wind direction is within 30 degrees of perpendicular to the ridge. Winds usually are 20 Knots or more at the ridge peak and increasing with altitude. Airmass stability can dramatically change the structure of the Wave. It may cause severe shifts

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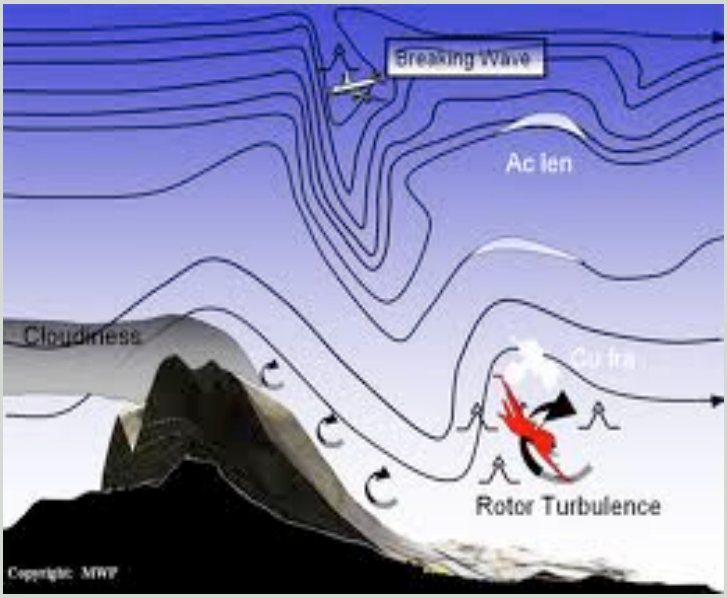
and shear well above the terrain. Clear air turbulence may be encountered in areas not expected. Note the diagram below illustrating a ***Breaking Wave***.



The best advice for flying in mountain wave conditions seems to be to *Pick Your Day*. Keep the following in mind:

- If winds aloft are reported over 20 Knots at the peak elevation of the ridges, it might be wise to wait it out.

- Check the forecast for when winds are predicted to shift more diagonal to the ridge lines as the severity of the wave oscillations will diminish with the wind shift.

- Read the clouds and avoid ragged and irregular lenticulars. Try to visualize the wave and anticipate the up draft / down draft areas and rotor areas.
- Cruise speeds should be reduced in areas suspected of wave activity to below Manoeuvring Speed.
- Pick routing away from more jagged terrain. Routing over valleys would be best at their narrowest crossing. Valleys over a few miles across are perfect for setting up a wave with strong rotor activity covering most of the valley area. This rotor may actually extend higher than the valley ridge peaks.
- Plan to cross ridge lines at a 45º angle and be especially mindful to fly in the up draft side of the valley, using the standard mountain flying technique.
- If experiencing unexpected tailwind or headwind conditions, be alert that the airmass may have changed from what the pre-flight brief predicted. Visualize wind direction and speed and how upcoming terrain may affect you.
- Securely stow everything in the plane and think of how heavy objects might move in severe turbulence.

There is a wealth of information on Mountain Waves on the internet, excellent notes on the NOAA website. And don't forget to read about it in your copy of 'From The Ground Up'.

Don't let the Wave bite you!

FUEL FLOW AND UNUSABLE FUEL TESTS

Jack Dueck

Loss of power or engine failure during initial test flights in a newly minted, amateur-built aircraft, is every builder's nightmare. Although fuel-flow problems are a leading cause of incidents, this risk can be managed easily and safely. Measuring the quantity of unusable fuel, and running a fuel-flow test for each tank is simple, easy, and offers solid evidence of the fuel system's performance, giving you the confidence that no restrictions or problems exist in getting an adequate flow of fuel to your engine.

This test does not involve running the engine. It measures the fuel quantity that would flow to your engine under normal conditions. In a high-wing aircraft it is the fuel that would flow through gravity; in a low wing, the fuel that would be delivered through the auxiliary fuel pump.

The fuel line should be sized to adequately supply the required quantity of fuel. Your engine manufacturer will specify the required size. By using a 3/8 inch minimum tubing size, the additional concern of a vapor-lock is reduced. It is also a good idea to use heat shields on the fuel lines as well as cooling shrouds around gascolators and mechanically driven fuel pumps. Do not use paper-type fuel filters that might collapse and block fuel flow if contaminated by water condensation in the fuel tanks.

We use weight as the fuel-flow test's unit of measure. It prevents errors of volume changes due to temperature expansion from creeping into the calculations.

Conventional four-stroke gasoline aircraft engines use approximately .55 lbs. of fuel per horsepower, per hour. Therefore, a conventional engine, rated at 160 HP could be expected to use 88 lbs. (.55 x 160) of fuel per hour. ***In addition, the FAA under FAR 23.955 has mandated a safety factor of 150% for high-wing, gravity-fed, fuel systems and a 125% factor for low-wing aircraft with an auxiliary fuel pump***. This engine should have a fuel-flow rate of at least 132 lbs. per hour (88 x 1.5) if it is in a high-wing aircraft, and 110 lbs. per hour (88 x 1.25) in a low-wing.

Modern electronic ignition systems have made some engines more efficient, and the above value of .55 lbs. per Hp per hour is perhaps overly conservative in these cases. Similarly, two-stroke engines are less efficient and the fuel flow per Hp per hour will be higher. Owners, can contact their engine manufacturer to get a flow value for maximum Hp output, to use in their calculations If the fuel-flow test using more conservative values proves adequate, why worry. Only if the fuel-flow values measured are less than these targeted (or calculated), should we become concerned.

Perform the test in a well ventilated area, away from open flames or other ignition sources. Have a fire extinguisher on hand. You will need a clean 5-gallon container, a stop watch, a large funnel, and an accurate scale that reads at least 35 lbs.

1. Record the empty weight of the 5-gallon container.
2. Incline the aircraft at an attitude simulating a normal climb configuration. If you have a tail wheel aircraft you can place its tail wheel into a ditch or depression. If you have a nose-wheel aircraft you can elevate the nose wheel by pushing down on the tail. A 20º climb attitude is recommended.
3. Disconnect the fuel line at the carburetor or at the injector manifold, but leave the inlet fitting attached to the fuel line. (You want to simulate the correct fuel-flow conditions.)
4. Use at least two gallons for each test. (More can be used for larger engines or for a more accurate data analysis.) With this fuel in the container, weigh it and record this weight. Pour the fuel into an absolutely empty tank. Reposition the container under the disconnected fuel line so as to capture all fuel flowing during the test. Use a funnel to ensure that all fuel is recaptured and none is spilled.
5. With your stop watch ready, activate your fuel pump and record the time it takes to pump this fuel through the system. With a high-wing aircraft the procedure is the same, but activate the flow by opening the fuel selector valve to the appropriate tank.
6. Re-weigh the container with the collected fuel and record this weight.
7. Repeat the above steps for each tank.

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Safety Check: Run a separate fuel flow test to ensure that your fuel selector valve stops the flow when you turn it to its 'off' position.

Here is an example of calculating Fuel-flow and Unusable Fuel in a hypothetical low-wing. The empty fuel container weights 4.3 lbs.

	LEFT TANK	RIGHT TANK
Initial fuel and container weight	17.5 lbs	20 lbs
Collected Fuel and Container Weight	15.25 lbs	16.8 lbs
Timed fuel-flow:	4 min. 20 sec. (4.33 min.)	5 min. 10 sec. (5.17 min.)

From this information we can now calculate:

	LEFT TANK	RIGHT TANK
Unusable Fuel	17.5–15.25=2.25 lbs. (2.25 / 6 = 0.375 gal.)	20.0–16.8=3.2 lbs. (3.2/6 = 0.533 gal.)
Usable Fuel used in the test	15.25 – 4.3 = 10.95 lbs.	16.8 – 4.3 = 12.5 lbs.
Measured Fuel Flow Qty. (lbs.) x 60 (min./hr.)/timed flow (min.) = Qty required (lbs./hr.)	10.95 x 60/4.33 = 151.7 lbs./hr.	12.5 x 60/5.17 = 145.1 lbs./hr.

Since our fuel-flow requirement for a 160 Hp engine in a low-wing aircraft is 110 lbs./hr., this test was successful. The same test can be performed with your aircraft in different flight attitudes, for example, in a gliding attitude.

This simple test will help you to control your fuel risks, a key to safety. It will give you a clear knowledge of any unusable fuel in your tanks, and that your system can and will supply adequate fuel for your engine in critical flight attitudes.

Checking your fuel gages is a final step in this risk management process. Fix the airplane in its level flight attitude and with the fuel tanks empty, (except the unusable fuel quantity as per above), check to see that your fuel gages read 'empty'. Now add fuel to each tank at two gallon intervals and check the gage readings. Record these readings. By comparing the recorded fuel quantities and their corresponding gage readings, you will know their accuracies. If necessary, you can make up a simple cross-referencing chart for each gage to give you a fuel quantity corresponding to any gage reading.

While performing this task, take a round dowel or suitable measuring stick, and insert it into your fuel tank. Mark the fuel level on the stick and repeat it for each of the two-gallon intervals. This will give you an accurate dip-stick to carry with you in your accessory case, and to use whenever you are unsure of the exact fuel quantity in any given tank. You can mark the same stick on different sides for different tanks.

Running out of fuel on any flight is an entirely preventable and manageable risk. With this exercise completed, sign the pilot statement below and insert this report in your Pilot Operating Handbook for reference.

Date:_____ Initials:_____

Please Update your web member profiles

On our web site, in the member's section, there are many pictures and profiles that are quite dated (clecoed aluminum parts which are now beautiful flying machines). The updates should be sent to Paul Gregory (eaahighriver@shaw.ca) Please supply: Name, project or aircraft, facts about your project and area of aviation interest.

FOR SALE

- SPOT GPS tracker for $120.00, in the box with all documentation. This includes 4 months of service with tracking ability and can be used immediately. Call Calvin at H 403 932-4325 or leave message on Cell at 403 860-7582 or email at this email cbthorne@xplornet.com

- Acro Sport II Biplane project. $7,500.00. Tacked fuselage, wings ready to cover, fuel tank, wheels, brakes, plenty of spare hardware, tubing, aviation plywood, fittings, much more. Good starter project. Search for *Acro Sport II Biplane project* on calgary.kijiji.ca.

How to Join Our Chapter

Attend our next chapter meeting. Ask for anyone and they will be pleased to help. All the required forms will be made available for you to fill out. You must be a current member of EAA International, so please have your EAA membership number. If you are not a member, you can join EAA at the meeting.

Contact us by post at
EAA Chapter 1410
Box 5280, High River, Alberta
T1V 1M4
Or by email at
eaahighriver@shaw.ca

We can send you the registration forms if you like. Contact Marv Fenrick (see the last page with the list of the executive).

EAA SportAir Workshops are coming up.

May 14-15	*Annual inspection for homebuilts*
May 14-15	*Test Flying your home built*

Course fees are $300 for EAA members, $350 for non-members. All courses are at the High River Regional airport. Email cgyrv@yahoo.com for more information.

Airplane Wisdom

The *minimum* number of planes one should own is one. The *correct* number is n+1, where n is the number of planes currently owned. This equation may also be re-written as s-1, where s is the number of planes owned that would result in separation from your partner.

Upcoming Flights and Events

May 8, 2011 Sundre/COPA Flight 146 Sundre airport's 25th year will be honoured at the Mothers Day fly in breakfast from 8 a.m. to 12 noon. For more information please contact Mountain View Pilots and Flying Association/Sundre Flying Club President Bryce Schacher 403-556-1369, bryces@telus.net or Alf & Norma Bicknell 403-638-9001, anbic@telus.net

May 11, 2011 What it takes to be an airline Pilot. Presented by Ian Caldwell of WestJet, at the Calgary Flying Club.

May 14, 2011 Rocky Mountain House / COPA flight 166 For more information, please contact Alan Acker at 403- 845-0978 or email ala@ghgsolutionscorp.ca

June 8, 2011 Our very own Doc Adams. Brendan Adams, at the Calgary Flying Club.

June 11 – 23, 2011 Newfoundland "Screech In" Kiss The Cod Pilgrimage: There is a sign-up sheet at the Calgary Flying Club. For more information, contact Johann at jvandermerwe@shaw.ca.

June 22, 2011 The 2011 Canadian Aviation History Society convention will take place in Edmonton, Alberta from Wed. 22 June to Sun. 26 June and will explore the theme "Edmonton: Gateway to the North." Visit **www.cahs.ca** for full program details.

July 9th , 2011 Calling all Speed Freaks. A fun, multi-category air race in Three Forks Montana. More information is to be posted on the website www.bigskyairrace.com. Or contact Kevin Danz at 406-431-8009

July 25 - 31, 2011 AirVenture

September 17, 2011 J3 Flyin Breakfast at Ron Janzen Aerodrome.

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